Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/577
JAPAN
February 1964
Submitted in:
ENGLISH and FRENCH

Confidential until official release during Conference

Abstract

Necessity of Nuclear Power Utilization and Development Programme in Japan

Japan Atomic Energy Commission

1. Along the lines of the Dubling National Income Plan decided in 1960 by the Government, the Japan Atomic Energy Commission established in February 1961 the Long-Range Programme on Development and Utilization of Atomic Energy covering 20 years, 1961-1980. According to the Plan, with the growth of economy, the electric power demands in 1970 and 1980 will be about 2.8 and 5 times as large as those in 1959 respectively, and this would require large scale development for power generation. Due to the gradual exhaustion of adequate sites for additional large capacity of hydro electric power, a great emphasis will naturally be placed upon development of thermal electric power. Consequently, composite ratio of imported energy sources to all types of energy sources will be increased to 59 percent in 1970 and to 73 percent in 1980, mainely due to importation of crude oil for power generation.

2. Thus, not only from the viewpoint of sound foreign exchange policy but also of securing a stable supply of energy resources, Japan must develop cheaper sources of energy as well as diversify the types of energy supply. The Programme of the Commission and the recent Report of the Subcommittee on Over-all Energy Policy of the Ministry of International Trade and Industry indicate that nuclear power generation should be developed into one of principal energy supply recources of the country.

3. The Programme establishes the scales of nuclear power generation to be developed, about 1,000 MWE for the first ten years (development stage) and 6,000 - 8,500 MWE for the second ten years (practical progress stage) respectively. These plants are expected to be constructed and operated by private utility firms.

Last three years have demonstrated electric power demands will expand to greater extent than estimated in the Plan. The Programme of the Commission is endorsed and gaining more significance.

4. Construction of power plants, training of scientists and engineers, research and development of wide range, establishment of organizations and legislation, etc., have been steadily carried out. As to nuclear power station, a power demonstration reactor is in operation, and the first practical power plant is to be completed in 1965. Besides, four nuclear power stations are expected to be completed by around 1970. Accordingly, the scale of nuclear power generation by 1970 will exceed the target of the Programme. The reactors are imported, but technology for domestic manufacturing is being actively developed.
On the other hand, the Government is making efforts to set up governmental measures on spent fuel, and for reduction of fuel cost, etc., which are required to realize the development programme of the first period.

5. Research and development for nuclear ship have been conducted as provided in the Programme. In 1963, the plan for the first nuclear ship construction was set up, and a special agency was established for the purpose.

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CONSTRUCTION EXPERIENCE ON TOKAI ATOMIC POWER STATION

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The Tokai Power Station is the first commercial atomic power station in Japan. The Station, 166 MW gross electrical output, located 80 miles from Tokyo in the north-east direction, started its construction in December 1959 and is scheduled to go critical in December 1964.

The paper describes problems encountered and experience gained during the construction works of the Station and these are summarized in the following:

1. Station siting problem including meteorological surveys for investigating the atmospheric diffusion phenomena of the radioactive argon in the shield cooling air.

2. Special design feature of the Station including:

   a. Aseismic design for the plant items such as reactor building, graphite core, main gas ducting, etc., together with the method of structural analysis, the special vibration experiments and the acceleration levels involved.

   b. Special safety devices such as:

      Emergency shut-down device; a special device ensuring shut-down of the reactor with small boron steel balls contained in hoppers located at the lower end of standpipes, even in the case of severest earthquake causing deformation in the control rod channels thus preventing the control rods from proper operation.

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Emergency carbon-dioxide injection system; a system consisting of eight emergency gas storage tanks and suitable pipe-works to prevent the reactor from air ingress in the event of gas duct rupture.

Gas release and partial containment scheme; a scheme for discharging carbon-dioxide gas through planned path in the event of gas duct rupture accident.

3. Construction experiences, covering construction schedule, inspection during the course of the construction, major design changes, cooling water intake works, etc.